In the claims

7. A method for illuminating surfaces in [computer graphics]a computer-modeled scene comprising the steps of:

constructing a hemispherical light source of infinite radius;

constructing a plurality of surfaces within said scene, said surfaces consisting of a plurality of points[.];and

approximati[on]ng [of] the illumination effect [of each] of the hemispherical light source by the use of a plurality of point light sources.

REMARKS

Previously, claims 1-10 were pending in this application. Applicant neither adds nor cancels claims by this Response, accordingly claims 1-10 are pending.

The Examiner indicates that claims 1-6 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. no, 5,900,850 to Bailey et al. ("Bailey") in view of Glassner; Principles of Digital Image Synthesis ("Glassner").

Claim 1

Bailey

Bailey appears directed to a large, portable display system for use, for instance, in conjunction with a an indoor/outdoor stage performance. See col. 1, ll 14-19; Fig. 1 ref. # **14**; stage). The problem apparently solved by Bailey is that of a:

> "large scale portable image display system which is capable of being erected on, behind, or adjacent to a performance stage, [etc.] . . . for projecting large scale animated images, including video images and/or information to audiences which are usually located substantial distances from the display itself."

Col. 1, ll 40-45.

Bailey's solution to this problem appears to involve plural panels connected to each other with a web of flexible horizontal and vertical supporting members; the panels having plural light sources (light emitting diodes in e.g., Bailey's claim 1) mounted for projecting an image under control of a control circuit for energizing the light sources.

Glassner

Glassner appears directed towards formulation and solution to the radiance equation. As Glassner notes "This is the central equation of image synthesis, because it completely captures the distribution of light in a scene . . . The problem is that the radiance distribution L is described *implicitly*, so we know what conditions it must satisfy, but we don't know what it actually is. [¶] The process of shading in Chapter 15 was based on our being able to find a complete and explicit description of the light falling on a point. The heart of the image synthesis algorithms in this book is to use the radiance equation to find such a description." (Glassner, 871).

Glassner notes "So the big picture is that to find the radiance at a point **r** coming from direction w, we find the nearest surface point $s=h(\mathbf{r},w)$, compute its outgoing radiance into w and accumulate all the radiance due to volume emission or in scattering along the way from **s**. Schematically, we can write this as [Eq. 17.3]" (Glassner, 872). Glassner's Full Radiance Equation appears to be Eq. 17.10 on p. 875.

Applicant submits that Glassner is plainly directed towards illumination/shading modeling in connection with the rendering computer-modeled images.

Applicant's invention

Applicants invention is also related towards illumination and shading in connection with the rendering process of computer-modeled images. Applicant submits this is evident from, for instance, from Figs. 2-4. See also, Specification, p.3.

Applicant's invention is directed towards illumination and shading without using radiosity analysis such as that taught by Glassner.

As Applicant notes "Determining the illumination effect by radiosity analysis for each of these points would require a numerically complex integration over the portion of the light sphere that illuminates the points. The described invention approximates these calculations with results that are almost indistinguishable from the numerically complex integration." (Specification, p. 5, ll. 4-9). "The invention achieves an illumination effect similar to that of true radiosity analysis at a computational cost comparable to that required for a point source." (Specification, p.6, ll 9-11).

Unfounded obviousness rejection

Federal Circuit law:

> "makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references. See, e.g., C.R. Bard, Inc. v. M3 Sys., Inc., 157 F.3d 1340, 1352, 48 USPQ2d 1225, 1232 (Fed. Cir. 1998) (describing "teaching or suggestion or motivation [to combine]" as an "essential evidentiary component of an obviousness holding"); In

re Rouffet, 149 F.3d 1350, 1359, 47 USPQ2d 1453, 1459 (Fed. Cir. 1998) ("the Board must identify specifically . . . the reasons one of ordinary skill in the art would have been motivated to select the references and combine them"); In re Fritch, 972 F.2d 1260, 1265, 23 USPQ2d 1780, 1783 (Fed. Cir. 1992) (examiner can satisfy burden of obviousness in light of combination "only by showing some objective teaching [leading to the combination]"); In re Fine, 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988) (evidence of teaching or suggestion "essential" to avoid hindsight).

. . . .

Combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability--the essence of hindsight. See, e.g., Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 1138, 227 USPQ 543, 547 (Fed. Cir. 1985) ("The invention must be viewed not with the blueprint drawn by the inventor, but in the state of the art that existed at the time.")."

In re Dembiczak, 175 F.3d 994, 999 (Fed. Cir. 1999).

Applicant respectfully submits that the Examiner's combination of references is unfounded.

In Part 3 of the Office Action, the Examiner indicates "Bailey, in disclosing a portable large scale image display system, also discloses a method for illuminating surfaces in computer graphics constructing one or more finite light sources within a computer animated scene. Each of the finite light sources is a sphere (claim 6; 34, FIG. 6) having a finite radius and a center (claim 1; abstract, 2nd sentence); and the method further consists of constructing a plurality of surfaces with the scene, each surface consisting of a plurality of points (claim 1, abstract 3rd sentence). Moreover, a portion of each of the light sources illuminates each of the points (claim 2; Abstract 3rd sentence).

The Examiner indicates in Part 6 of the Office Action "it would have been obvious to one of ordinary skill in the art to have modified the Bailey portable large scale image display system in view of the Glassner radiance equation by adding the equation to the code executed by Bailey's CPU **46** in order to approximate the illumination effect of the finite light sources. Such a modification to Bailey would provide a higher quality image because of better calculation of the effect of the finite light sources on the display"

No motivation or suggestion for combination in the references

Applicant is unaware of any teaching or suggestion in the references cited that provides motivation or suggestion for the Examiner's combination. If the Examiner believes there is such, Applicant respectfully requests the Examiner cite page/column and line number for

this showing. Applicant respectfully notes "[T]he showing must be clear and particular." Dembiczak, 175 F.3d at 999.

No motivation or suggestion for combination from knowledge of one skilled in the art fields

Applicant submits that one skilled in the field of illumination modeling in computer graphics (Glassner) would understand the large portable display system of Bailey (primary class 354/55--display/matrix) as an unrelated and nonanalogous art field (and vice versa). Applicant submits one skilled in either field, and in particular in the field of illumination modeling in computer graphics, would have no general suggestion or motivation to combine the references.

No motivation or suggestion for combination from problem to be solved

As noted above, the problem solved by the Applicant is realistic illumination in computer modeled images without computational cost of radiosity analysis.

Glassner is directed towards radiosity analysis and, Applicant submits, thus plainly directed towards a separate problem.

As noted above, Bailey is directed towards making a large display that is lightweight and portable. Applicant submits this is a problem unrelated to computationally efficient illumination modeling of a computer modeled scene.

Applicant respectfully submits the problem solved by Applicant's claimed invention is unrelated to the Bailey reference and one skilled in the field would have no suggestion or motivation to look towards teachings of large portable display art to reduce the computational load in illumination modeling of a computer modeled scene.

References teach away from combination as combination is inoperable

There is no suggestion to combine if a reference teaches away from its combination with another source. See Jurgens v. McKasy, 927 F.2d 1552, 1557, 18 USPQ2d 1031, 1035 (Fed. Cir. 1991) at 1075, 5 USPQ2d at 1599. If when combined, the references "would produce a seemingly inoperative device," then they teach away from their combination. In re Sponnoble, 405 F.2d 578, 587, 160 USPQ 237, 244 (CCPA 1969); see also In re Gordon, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984) (finding no suggestion to modify a prior art device where the modification would render the device inoperable for its intended purpose).

The Examiner's combination would be inoperative as the radiance equation of Glassner requires inputs that are unavailable in the display of Bailey. The Examiner's combination appears to contemplate using the radiance equation in some fashion to display a

"higher quality image." Applicant submits the radiance equation as used in Glassner contemplates an entirely computer-modeled scene containing computer-modeled surfaces and in which there exists computer-modeled light sources. Applicant submits that Bailey includes nothing related to computer modeling of scene and accordingly provides no starting point for application of Glassner's radiance equation. As noted above, the Examiner appears to indicate light sources as Bailey's LEDs and appears to indicate surfaces as Bailey's supporting infrastructure. Applicant submits combination with Glassner requires computer-modeled light sources and surfaces and computer modeled illumination. Accordingly applicant submits the Examiner's combination would be inoperable.

Furthermore, the Examiner's combination does not provide an operable system for solving the problem to be solved by the Applicant. As noted above, Applicant's invention is directed toward illumination modeling of a computer-modeled scene without the enormous computational load of the radiosity methods such as those described in Glassner.

The Examiners combination includes the radiosity computations of Glassner! One applying Glassner's radiosity teachings as has the Examiner would not be solving the problem to be solved by Applicant's claimed invention. Applicant's specification notes:

> "[C]omputer artists and animators do not currently use finite light sources to illuminate their graphics and their scene. Determination of the total contributing light from a finite source to a surface point, has, till this point required a numerical integration over the entire surface of the finite source. Such calculations are simply too cumbersome to be practically used in computer animation. Finite light sources are sometimes used to illuminate single computer-generated scene or "photos" when a highly realistic image is desired and computational speed is not an issue, but even in these situations the computational burden is considered onerous." Specification, p.2, ll 1-8.

Applicant submits the burdensome computations referred to above include precisely those of Glassner's teachings. Accordingly, the Examiner's suggestion to use Glassner's techniques (somehow) in the large portable display of Bailey would, in no way, solve the problem to be solved by Applicant's claimed invention. Accordingly, Applicant submits the references teach away from the Examiner's combination.

Claims 2-6

Claims 2-6 depend from claim 1 and either directly or indirectly and incorporate its features. In the Office Action, the Examiner indicates claims 2-6 are rejected under various combinations of reference teachings. Applicant submits claims 2-6 are in condition for allowance as depending from an allowable claim 1 and omits further remarks establishing patentability of these claims over the references cited. Applicant does not acquiesce to, or accept, the Examiner's rejections or characterization of these claims or such reference teachings.

Claim 7

In Part 8 of the Office Action, the Examiner indicates that claims 7-10 stand rejected under 35 U.S.C. 102(b) as being unpatentable over U.S. Patent no. 5,572,635 to Takizawa et al ("Takizawa").

As an initial matter, Applicant notes Takizawa claims priority to a Japanese application and appears to be less clear in English than the original Japanese may have been. Applicant respectfully requests that, should the Examiner maintain the rejection based on Takizawa after a more complete read of this reference and Applicant's specification and claims, that the Examiner state with particularity (1) which features in Takizawa it is the Examiner's position correspond to the features in Applicant's claims, and (2) all passages by column and line number of Takizawa where the Examiner believes such teachings are found.

In Part 9 of the Office Action, the Examiner states. "Takizawa, in disclosing a method for changing a natural image based on a light environment in the natural image, also discloses . . . and approximation of the illumination effect of each of the hemispherical light source by the use of a plurality of point light sources (Abstract, 3rd to 5th sentences)."

This portion of Takizawa's abstract provides "The color of the object area is generated from a reflection model of the object, based on the color of sunlight, the color of a sky light, an a reflectance of the object. The sky light is determined by averaging pixel values of the sky area. The color of the sky light can be determined based on the color of the sunlight and meteorological conditions such as clouds and fog."

The Examiner also indicates in Part 9 "Takizawa, in disclosing a method for changing a natural image based on a light environment in the natural image, also discloses . . . constructing a hemishperical light source of infinite radius (sky light, Abstract, 4th sentence).

This portion of Takizawa's abstract provides "The sky light is determined by averaging pixel values of the sky area."

Applicant's amended claim 7 recites features neither taught nor suggested by the references cited including, for instance, "approximating the illumination effect of the hemispherical light source by the use of a plurality of point light sources."

From the Examiner's comments in Part 9, it appears the Examiner contends the "hemispherical light source" corresponds to the "sky light" in Takizawa. If this is the Examiner's position, then Takizawa plainly does not anticipate. Applicant respectfully submits the passages cited by the examiner in sentences 3-5 nowhere teach or suggest "approximating the illumination effect of the hemispherical light source by the use of a plurality of point light sources."

Claims 8-10

Claims 8-10 depend from claim 7 and either directly or indirectly and incorporate its features. In the Office Action, the Examiner indicates claims 8-10 are rejected under various combinations of reference teachings. Applicant submits claims 8-10 are in condition for allowance as depending from an allowable claim 1 and omits further remarks establishing patentability of these claims over the references cited. Applicant does not acquiesce to, or accept, the Examiner's rejections or characterization of these claims or such reference teachings.

Conclusion

Applicant respectfully submits all pending claims are in condition for allowance and requests their allowance. Should the Examiner believes prosecution of this application would be advanced by conferring with Applicant's attorney, he is invited to contact the undersigned attorney at (650) 849-4930

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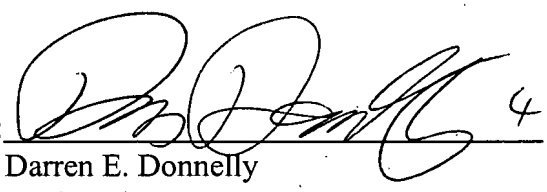
By:  44,093
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